

Research Note 86-65

1

MEDIA SELECTION ANALYSIS FOR 19K BNCOC

Joni A. Jay
Scientific Systems, Inc.

AD-A169 670

ARI FORT KNOX FIELD UNIT
Donald F. Haggard, Acting Chief

TRAINING RESEARCH LABORATORY
Harold Wagner, Acting Director

DTIC
ELECTE
JUL 11 1986
S A D



U. S. Army

Research Institute for the Behavioral and Social Sciences

June 1986

Approved for public release; distribution unlimited.

DTIC FILE COPY

86 7 11 039

U. S. ARMY RESEARCH INSTITUTE FOR THE BEHAVIORAL AND SOCIAL SCIENCES

A Field Operating Agency under the Jurisdiction of the
Deputy Chief of Staff for Personnel

EDGAR M. JOHNSON
Technical Director

WM. DARRYL HENDERSON
COL, IN
Commanding

This report, as submitted by the contractor, has been cleared for release to Defense Technical Information Center (DTIC) to comply with regulatory requirements. It has been given no primary distribution other than to DTIC and will be available only through DTIC or other reference services such as the National Technical Information Service (NTIS). The views, opinions, and/or findings contained in this report are those of the author(s) and should not be construed as an official Department of the Army position, policy, or decision, unless so designated by other official documentation.

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

DD FORM 1473

i

~~Unclassified~~

Unclassified

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

lists a set of topics for CBT development and specifies the depth and breadth of the proposed training. *Appendix 1*

MEDIA SELECTION ANALYSIS FOR 19K BNCOC

CONTENTS

	Page
OVERVIEW.....	1
BACKGROUND.....	2
Requirements for Instructional Media.....	2
Performance Levels of Instruction.....	5
MEDIA SELECTION ANALYSIS—METHODOLOGY.....	6
Step 1: Determine Objective Performance Level.....	6
Step 2: Apply Media Selection Model.....	6
Step 3: Applying the Final Selection Process.....	15
RESULTS.....	18
OPTIONS FOR CBT DEVELOPMENT: RECOMMENDATIONS.....	19
CONCLUSION.....	23
REFERENCES.....	24
APPENDIX A. SAMPLE OBJECTIVE ANALYSIS FORM.....	25
B. SELECTION OF OBJECTIVES FOR THE ANALYSIS.....	27

LIST OF TABLES

Table 1. Instructional Requirements.....	4
2. Media Selection Analysis Summary.....	8
3. Option One.....	20
4. Option Two.....	21
5. Option Three.....	22

LIST OF FIGURES

Figure 1. Example of Media Selection Analysis Using Model "Prepare for an NBC Attack".....	12
---	----

MEDIA SELECTION ANALYSIS FOR 19K BNCOC

OVERVIEW

Typically, instructional designers select instructional media by identifying the instructional requirements of a task and then matching them to the characteristics of each available medium. These instructional requirements generally include factors such as instructional setting, learner characteristics, categories of learning objectives, and instructional strategies (Reiser and Gagne, 1983).

In this project, however, computer-based training on MicroTICCIT with videodisc capability has already been selected as the medium of choice for some objectives in the 19K Program of Instruction. ARI selected CBT on MicroTICCIT for many reasons, including the desire for uniformity of instruction, an insufficient number of instructors, and the desire to fully utilize the MicroTICCIT System II at Fort Knox.

The task then, was to identify the characteristics of the medium (MicroTICCIT) and select the 19K BNCOC objectives that could best be presented using this CBT system. In essence, the task was to apply a media selection technique in reverse.

The first section of this report provides background concerning the media selection process. In the second section, the methods used to perform the media selection analysis are described. The final section contains a description of the analysis and provides three options for courseware development in this project.



Accession For	
NTIS GRA&I	<input checked="checked" type="checkbox"/>
DTIC TAB	<input type="checkbox"/>
Unannounced	<input type="checkbox"/>
Justification	
By _____	
Distribution _____	
Availability Codes	
and/or	
Initial	

A-1

BACKGROUND

Requirements for Instructional Media

Instructional media requirements can be defined as the set of necessary features required to deliver content to the learner enabling him/her to master the objective. Many authors have listed instructional features or properties to be examined when selecting media (Gagne and Briggs, 1979; Gerlach and Ely, 1980; Romiszowski, 1981). A list of instructional requirements has been adapted from existing documentation (Marco, Begg, Israelite, Bernstein, 1985) for the purposes of this task.

The requirements fall under the following categories:

1. Display/presentation.
2. Student response.
3. Response detection/evaluation.
4. Feedback/guidance.
5. Learner control.
6. Answer type.

Each of these features is described below.

Display/presentation refers to the ways in which a particular medium presents instructional information and activities. Examples of display/presentation features include audio, realistic graphics and tactile sensations. Most computer-based training can provide realistic graphics and audio, but not tactile sensations (the "feel" of an object).

Student response refers to the ways in which a student can interact with a given medium. Examples of student response features include writing/typing, speaking, marking, and manipulating 3-dimensional hardware. Most computer-based training allows for writing/typing, marking and some allow speech interaction.

Response detection/evaluation refers to the ways in which a student can be evaluated by the medium. Automated right-wrong answer scoring is an example of this feature provided by CBT.

Feedback/guidance refers to the ways in which the medium can provide the student guidance about what to do or feedback about what has been done. Examples include written information, branching to a new display, and visual cuing. Computer-based training can provide all of these features.

Learner control refers to the ways in which a medium allows the learner to control the content and sequence of the instruction. Classroom instruction generally is instructor-directed and does not allow the student to control either sequence or content. Computer-based training allows the student to control either.

Answer type refers to the ways in which the student is expected to respond to practice or test items. Major answer types include selected responses (e.g. multiple choice or sequencing), student generated short and long answers and simulations. CBT provides all answer type features, although answer judging for long student generated answers requires sophisticated programming and considerable expense.

Table 1 lists each of the instructional requirements. A few instructional requirements (such as smell sensations) are not included since they clearly are not necessary for this task. Table 1 also provides a list of the instructional requirements that can be provided by MicroTICCIT. Note that MicroTICCIT can provide for most instructional requirements.

The major features that CBT cannot provide are hands-on situations, interactions between people, and performance of a task in the actual environment. In some cases, MicroTICCIT can provide for a particular instructional requirement in some circumstances, but not in others. For example, MicroTICCIT can judge long student generated answers up to a point by matching key words, but it cannot judge general ideas that may be expressed in a variety of ways.

For all media, but particularly CBT, additional features generally mean additional development time and expense. Since development time and cost are important factors in selecting objectives appropriate for this project, some method of estimating whether objectives require more or less resources than usual is needed. As a baseline, a "typical" lesson on MicroTICCIT has been defined as one which provides:

- o text displays
- o non-technical graphics and line drawings
- o a typed student response
- o automated right-wrong scoring
- o text feedback and branching to new displays
- o student control of the sequence of components in the lesson
- o student response by selecting from predetermined choices

Experience shows that additional features (e.g. motion video, manipulation of 2-dimensional hardware, verbal student response) require additional time and money to develop. Table 1 summarizes the features which require additional time and expense on MicroTICCIT compared to the "typical" MicroTICCIT lesson.

Table 1

Instructional Requirements

What CBT Can Provide		
Category	Provided by MicroTICCIT?	Increased Cost
Display/presentation requirements		
Audio	yes	yes
Unenhanced video (still)	yes	yes
Enhanced video (still)	yes	yes
Realistic graphics	yes	yes
Enhanced graphics	yes	no
Line drawings	yes	no
Cartoons	yes	yes
Video motion	yes	yes
Text/numbers	yes	no
Tactile sensations	no	NA
Kinesthetic Sensations	no	NA
Student response requirements		
Written/typed	yes	no
Oral	yes	yes
Point, Touch, Mark	yes	sometimes
Manipulate 2D hardware	yes	yes
Manipulate 3D hardware	no	NA
In actual environment	no	NA
Response detection/evaluation		
Delayed instructor scoring	yes	sometimes
Student self-observation	sometimes	yes
Automated right/wrong scoring	yes	no
Instructor observation	no	NA
Feedback/guidance requirements (cost rises with increased completeness of feedback and responses requiring different feedback)		
Text	yes	no
Oral	yes	yes
Branch to new display	yes	no
Real-time interaction	sometime	yes
Performance playback	sometimes	sometimes
Visual cuing	yes	no
Help	yes	yes

Category	Provided by MicroTICCIT?	Increased Cost
Learner control requirement		
Learner controls content and sequence	yes	sometimes
Learner controls content only	yes	sometimes
Learner control sequence only	yes	no
No learner control	yes	sometimes
Answer type		
Selected response	yes	no
Student generated		
short answer	yes	sometimes
long answer	sometimes	yes
Simulation	yes	yes

Performance Levels of Instruction

The type of response that the student must give is often the deciding factor in whether an objective can be taught using computer-based training. Objectives which can be performed by marking a location, selecting an answer or ordering a list, can appropriately be taught on CBT because it can provide appropriate response capabilities. But what about objectives which state (or imply) a type of student response that a computer seems unable to provide?

Objectives can be described as having three performance levels: crawl, walk, run. Crawl describes basic behaviors the student must have in order to complete the objective. Run describes the complete behavior the student must demonstrate in the field. Walk describes student behavior somewhere in between. For example, the objective "Use the M256 Chemical Detector Kit" can be taught at the crawl level by simply identifying the steps for using the kit; it can be taught at the walk level by simulating the steps necessary to use the kit; and it can be taught at the run level by use of the kit under field conditions.

Ideally, all instructional objectives would describe the run behavior while crawl and walk behaviors would be described by enabling objectives; or there would be a separate objective for each: crawl, walk and run. Since the objectives in many cases (and in the case of the 19K POI in particular) are not broken down in this manner, judgments must be made about the desired end-behaviors, and the conditions and content of the enabling objectives for each objective.

MEDIA SELECTION ANALYSIS—METHODOLOGY

The media selection and recommendation process has been broken down into three major steps:

1. Determine objective performance level.
2. Apply modified media selection model.
3. Make final selection based on instructional features, cost of development for objectives at given performance levels, ARI priorities and student GO rates.

The application of each step in the analysis of the 19K BNCOC curriculum will be explained in detail in the following section.

Step 1: Determine Objective Performance Level

In order to determine the performance level (crawl, walk, run) of each objective, the POI and lesson plans were examined. Objectives, enabling objectives, testing conditions, and criteria were used to determine the performance level of each objective as currently taught in the 19 K BNCOC curriculum. The results of this analysis are listed in Table 2, page 8 , in the column labeled "Objective Level". Appendix A contains an example of data forms used to collect this and other information about the objectives.

Step 2: Apply Media Selection Model

Reiser and Gagne's (1983) model for selecting media, a model developed for ARI, was chosen for this analysis. Although the model is useful for most media, it narrowly defines CBT, and some portions of it are not applicable to this analysis. Therefore, several modifications were made to the model for this task. First, the definition of computer-based training has been expanded on the media selection flowchart (See Appendix B) to include: interactive TV, motion pictures, slide/tape, TV cassette, audio, a variety of visuals (e.g. charts), and in some cases, portable equipment and training devices. These have been added because MicroTICCIT System II with videodisc can provide the same visual/audio stimulus and the same type of student response as those media.

Portable equipment and training devices have sometimes been included as CBT, because some objectives which normally require hands-on practice can be successfully simulated on CBT. The Model Training Program for Reserve Components (MTP-RC) simulated troubleshooting and maintenance tasks on the M1 tank using equipment such as a multimeter. Preliminary results from field testing show that more students who receive computer-based training on

these lessons pass the test with no errors (receive a GO) the first try than those who have not taken the CBT. Portable equipment and training devices have not been included with CBT when the objective requires tactile or kinesthetic input or response or when the manipulation of three-dimensional hardware is required.

The second modification to the Reiser-Gagne media selection model was to eliminate certain questions from the model, such as "Will the lesson be centrally broadcast?", which were clearly inappropriate for this analysis.

Prior to the analysis, information was collected about each objective and preliminary suggestions made for possible instructional strategies for each. This information was gathered from the Program of Instruction, lesson plans and tests, and interviews and observations at Fort Knox. Each objective was analyzed for information required by the media selection model: learning domain, instructional setting. In addition, the performance level (crawl, walk, run) of each objective as stated in the POI, was determined. Preliminary ideas for designs of potential CBT lessons were sketched out for all appropriate performance levels. Finally, instructional requirements and resulting comparative costs were specified for the performance levels considered appropriate for CBT. An example of the forms used to collect and analyze data for each objective is contained in Appendix A.

The model also required a determination as to whether students are competent readers. Based on ARI information, discussions with 19K instructors and observation of 19K BNOC classes, it was determined that the majority of students can read at the 6th or 7th grade reading level.

Once the preliminary questions were answered, objectives were put through the media selection flowchart (see Figure 1 for an example). The first question asked about each objective was whether the consequences of a task error are serious. Although many objectives, such as "Initiate Unmasking Procedures", would have serious consequences in the run mode (in the field under simulation of actual circumstances), objectives would only be taught at the crawl or walk levels on CBT.

The following is a step-by-step description of the information collection and analysis done for one objective on the POI: "Prepare and Issue an Oral Operations Order." The objective, as stated on the POI, was determined to be at the walk level; that is, students did not actually have to prepare and issue an oral operations order in the field, but they had to do more than list the steps. Next, the primary learning domain was determined to be "Intellectual" because the task requires following a rule. The instructional setting was determined to be individual, since classroom or field setting is not necessary for performance.

Table 2

MEDIA SELECTION ANALYSIS SUMMARY

ANNEX	TASK NUMBER	TASK TITLE	PRIORITY	CLASS	HOURL	OBJEC.	LEVEL	LEARN	DOMAIN	SETTING	CAI	APPRO?	RATE	STUDENT	CO	TIME/COST
Annex A Info Brief	---	Alcohol and Drug Abuse Prevention	6 ^a	1 ^b	---	---	---	---	---	---	Deleted ^f	---	---	---	---	---
Annex A Info Brief	---	Law of Land Warfare/SAEDA Orientation (Geneva Hague Conven)	6	2	---	---	---	---	---	---	NA	---	---	---	---	---
Annex A Info Brief	---	Equal Opportunity	6	1	---	---	---	---	---	---	Deleted	---	---	---	---	---
Annex B MCD Response	---	Duties and Responsibilities of an NCO	6	2	---	---	---	---	---	---	Yes ^e	---	---	---	---	1 ^g
Annex B MCD Response	---	Physical Fitness	6	4	---	---	---	---	---	---	NA	---	---	---	---	---
Annex B MCD Response	1/1 0/0 15/26	Conduct Performance Counseling with a Subordinate	6	4	---	---	---	---	---	---	Yes	---	---	---	---	---
Annex B MCD Response	8/4 8/6 20/10	Prepare to Conduct Training	6	24	---	---	---	---	---	---	Yes	---	---	---	---	---
Annex B MCD Response	8/4 8/9 10/20	Conduct Training	6	4	---	---	---	---	---	---	Yes	---	---	---	---	---
Annex B MCD Response	8/4 1/6 10/10	Evaluate the Conduct of Training	6	4	---	---	---	---	---	---	Yes	---	---	---	---	---
Annex B MCD Response	---	Install MILES Equipment	6	8	---	---	---	---	---	---	NA	---	---	---	---	---
Annex C Land Navigation	0/1 3/9 10/11	Determine Azimuth Using Protractor	6	4	---	---	---	---	---	---	DEV	---	---	---	---	---
Annex C Land Navigation	0/1 3/9 10/11	Determine Magnetic Azimuth Using a Compass	6	4	---	---	---	---	---	---	DEV	---	---	---	---	---
Annex C Land Navigation	0/1 3/9 10/12	Orient a Map to the Ground by Map/Terrain Association	6	1.3	---	---	---	---	---	---	DEV	---	---	---	---	---
Annex C Land Navigation	0/1 3/9 10/13	Determine a Location on the Ground by Terrain Association	6	1.6	---	---	---	---	---	---	DEV	---	---	---	---	---
Annex C Land Navigation	0/1 3/9 10/18	Determine Directions Using Field Expedient Methods	6	1.6	---	---	---	---	---	---	DEV	---	---	---	---	---
Annex C Land Navigation	0/1 3/9 10/11	Orient a Map Using a Compass	6	1.1	---	---	---	---	---	---	DEV	---	---	---	---	---
Annex C Land Navigation	0/1 3/9 10/14	Locate an Unknown Point on a Map or Ground by Intersection	6	3.5	---	---	---	---	---	---	DEV	---	---	---	---	---
Annex C Land Navigation	0/1 3/9 10/15	Locate an Unknown Point on a Map or Ground by Resection	6	3.5	---	---	---	---	---	---	DEV	---	---	---	---	---
Annex C Land Navigation	0/1 3/9 10/16	Navigate from One Point on the Ground to Another	6	3.6	---	---	---	---	---	---	DEV	---	---	---	---	---
Annex C Land Navigation	1/1 1/21 10/16	Identify Adjoining Map Sheets	6	.9	---	---	---	---	---	---	DEV	---	---	---	---	---
Annex C Land Navigation	0/1 3/9 10/11	Identify Terrain Features (Natural and Man-made) on a Map	6	4.8	---	---	---	---	---	---	DEV	---	---	---	---	---
Annex C Land Navigation	0/1 3/31 08/20	Analyze Terrain Using the Five Military Aspects of Terrain	6	1.2	---	---	---	---	---	---	DEV	---	---	---	---	---
Annex D NBC Defense	0/31 50/3 300/7	Prepare for an NBC Attack	1	1	---	---	---	---	---	---	Yes (c/w)	---	---	---	---	1(c)
Annex D NBC Defense	0/31 50/3 300/2	Initial Unmasking Procedures	1	4	---	---	---	---	---	---	Yes (c/w)	---	---	---	---	1(w)
Annex D NBC Defense	0/31 50/3 300/5	Prepare and Submit NBC-1 Reports	1	1	---	---	---	---	---	---	Yes (c/w)	---	---	---	---	1(c)

Table Continued

ANNEX	TASK NUMBER	TASK TITLE	PRIORITY	CLASS	HR	OBJEC.	LEVEL	LEARN	DOMAIN	SETTING	CAI	APPROP?	RATE	2	TIME/COST
Annex D NBC Defense	031-503-2001	Read and Report Radiation Dosages	1	1	1	Run	1	1	1	1	Yes (c/w)	98	1(w)		
Annex D NBC Defense	031-503-3009	Use and An/PUR-27 Radiac Set	1	1.2							Deleted				
Annex D NBC Defense	031-503-3008	Implement Mission-Oriented Protective Posture (MOPP)	1	4.1		Run	1	1	P	P	Yes (c/w)	95	2(c/w)		
Annex D NBC Defense	031-503-3001	Use the M256 Chemical Detector Kit	1	4		Run	1	1	P	P	Yes (c/w)	99	2(c/w)		
Annex D NBC Defense	031-503-4004	Prepare and Submit NBC-4 Reports	1	1		Walk	1	1	1	1	Yes (c/w)	86	1(c)		
Annex D NBC Defense	031-503-3003	Use an IM-174 Series Radiometer	1	1.7		Run	P	1	1	1	Yes (c/w)	95	2		
Annex E Military Communicat	113-571-1003	Establish, Enter or Leave a Radio Net	1	4		Walk			1	1	Yes (Dev)	86	3		
Annex E Military Communicat	113-573-6001	Recognize ECM and Implement ECM	1	1.5							DEV				
Annex E Military Communicat	113-588-1064	Install and Operate Hot-Loop Wire Communications	6	3.1							Deleted				
Annex E Military Communicat	113-596-1069	Construct Field Expedient Antennas	6	6							DEV				
Annex E Military Communicat	031-503-1705	Encode & Decode Maags Using KTC 600D Tactical Oper. Code	6	4							DEV				
Annex E Military Communicat	113-573-4002	Use KTC 1400 Man. Code Authent. Trns. & En/Decrypt Mag & Crd	6	4							DEV				
Annex E Military Communicat	113-573-8006	Use Automated Communications Elect Operation Instruction	6	4							DEV				
Annex F Mine Warfare	061-306-6005	Pre/Shot Std'd Shelling, Mortaring & Bombing Report	2	1.5							Deleted				
Annex F Mine Warfare	051-192-3032	Install a Hasty Protective Minefield	2	4		c/w	1	1	1	1	Yes	78	1		
Annex F Mine Warfare	051-192-3033	Remove a Hasty Protective Minefield	2	4		c/w	1	1	1	1	Yes	85	1		
Annex G Tactics	171-326-5626	Prepare/Issue an Oral Operation Order	3	4		Crawl	1	1	1	1	Yes				
Annex G Tactics	171-123-4008	Direct Consolidation/Reorganization on the Objective	3	2		Crawl	1	1	1	1	Yes				
Annex H Maint. Super	171-123-3002	Inspect DA Form 2408 For Accuracy	5	2.2		Walk	1	1	1	1	Yes				
Annex H Maint. Super	071-328-5302	Super Maint. of Indiv. & Tube Equipment	5	7		Crawl	1	1	I/G	I/G	Yes (c/w)	74	1(c)		
Annex H Maint. Super	-----	STX and FTX Maintenance	6	34		Run	P	G	G	G	NA				
Annex I TC Station/Gunnery	071-326-0512	Estimate Range	5	5.2		c/w	1	1	1	1	Yes (cw/)		3(w)		
Annex I TC Station/Gunnery	171-123-1002	Selecting Fire Positions	6	2.3							NA				
Annex I TC Station/Gunnery	071-126-3002	Prepare Commander's Weapon Station for Operating an M1 Tank	6								NA				
Annex I TC Station/Gunnery	171-126-3003	Secure Commander's Weapon Station on an M1 Tank	6								NA				
Annex I TC Station/Gunnery	171-126-3005	Prime Tank Commander Prevent Maint Prepare-to-Fire Checks on M1	6								NA				

Table Continued

ANNEX	TASK NUMBER	TASK TITLE	PRIORITY	CLASS	HOUR	OBJEC.	LEVEL	LEARN	DOMAIN	SETTING	CAI	APPROP?	STUDENT CO	
													RATE	TIME/COST
Annex I TC Station/Gunnery	171-126-3007	Prfrm Tnk Cauders Prev Maint After Fmg Checks/Service on M1	6										NA	
Annex I TC Station/Gunnery	071-313-3476	Boresight a Caliber .50 M2 HB Machinegun on an M1 Tank	6	5.1									NA	
Annex I TC Station/Gunnery	071-313-3475	Zero a Caliber .50 M2 HB Machinegun on an M1 Tank	6										NA	
Annex I TC Station/Gunnery	171-126-3010	Direct Main Gun Engagements on an M1 Tank	6	8									NA	
Annex I TC Station/Gunnery	171-126-3009	Direct Machinegun Engagements on an M1 Tank	6										NA	
Annex I TC Station/Gunnery	171-126-3004	Engage Trgts w/Main Gun from Cadrs Weapon Station on M1 Tnk	6	10.9									NA	
Annex I TC Station/Gunnery	171-122-3005	Engage Trgts w/M240 Gun Machinegun from CMS on M1 Tank	6										NA	
Annex I TC Station/Gunnery	071-313-3472	Engage Targets w/Caliber .50 M2 HB Machinegun on M1 Tank	6										NA	
Annex I TC Station/Gunnery	171-126-1028	Fire an M250 Grenade Launcher on an M1 Tank	6										NA	
Annex I TC Station/Gunnery	171-126-1053	Boresight/System Calibrate Main Gun on M1 Tank	6	4.8									NA	
Annex I TC Station/Gunnery		Training Devices	6	6.2									NA	
Annex I TC Station/Gunnery	071-313-3474	Install/Remove a Caliber .50 M2 HB Machinegun on an M1	6	8									NA	
Annex J Tact Field		Tactical Field	6	54									NA	
Annex K Situation		Situational Training Exercises	6	78.3									NA	
Annex L Crse Rev & Test		Diagnostic Testing	6	12									DEV	
Annex L Crse Rev & Test		BMCDC 19K Course Review	6	4									DEV	
CMT Annex A Info Brief		Subvraton & Espionage Directed Against US Army (SAE/DA)	6	2									NA	
CMT Annex A Info Brief		Equal Opportunity	6	1		C/W		I/A		I/G			Deleted	
CMT Annex A Info Brief		Alcohol and Drug Abuse	6	1		C/W		I/A		I/G			Deleted	
CMT Annex B MCO Response		Physical Readiness	6										NA	
CMT Annex B MCO Response		Moral and Ethics Development	6										NA	
CMT Annex D		NBC Defense	6										(See Annex D)	
CMT Annex E		Operations Security	6										NA	
CMT Annex H Maint Supervision		Prevention of Motor Vehicle Accidents	6										NA	
CMT Annex H Maint Supervision		Army Safety Program	6										NA	
CMT Annex J TC Station		Opposing Force (OPFOR)	6										NA	

Table Continued

ANNEX TASK NUMBER TASK TITLE PRIORITY CLASS HOUR OBJEC. LEVEL LEARN DOMAIN SETTING CAI APPROP? RATE - 2 TIME/COST

CMT Annex S TC Station	---	Code of Conduct	6	---	---	---	NA	---	---
CMT Annex S TC Station	---	Heat, Cold & Hearing Injury Prevention	6	---	---	---	NA	---	---
CMT Annex S TC Station	---	Survival, Escape, Resistance	6	---	---	---	NA	---	---
Call for/Adjust	---	Call for Fire-Grid Method	4	4	---	---	Yes	6.25	3(w)
Call for/Adjust	---	Call for Fire-Polar Method	4	4	---	---	Yes	*	3(w)
Call for/Adjust	---	Transmit Adjustments	4	4	---	---	Yes	*	3(w)
Call for/Adjust	---	Identify OT Factor	4	4	---	---	Yes	*	3(w)

* 2 or Time Included in another objective

- a) Priority = AML Priority
I(highest)-6(lowest)
- b) Class Hour= Hours allotted on PUI/Lesson Plan
* time included with another objective
- c) Objective Level as stated in PUI: crawl, walk, run
- d) Learning Domain
C = Cognitive
I = Intellectual
P = Psychomotor
A = Attitude
V = Verbal Information
- e) Setting = Setting Stated for Objective in PUI
I = Individual
G = Group/Classroom with Instructor
F = Field with Instructor

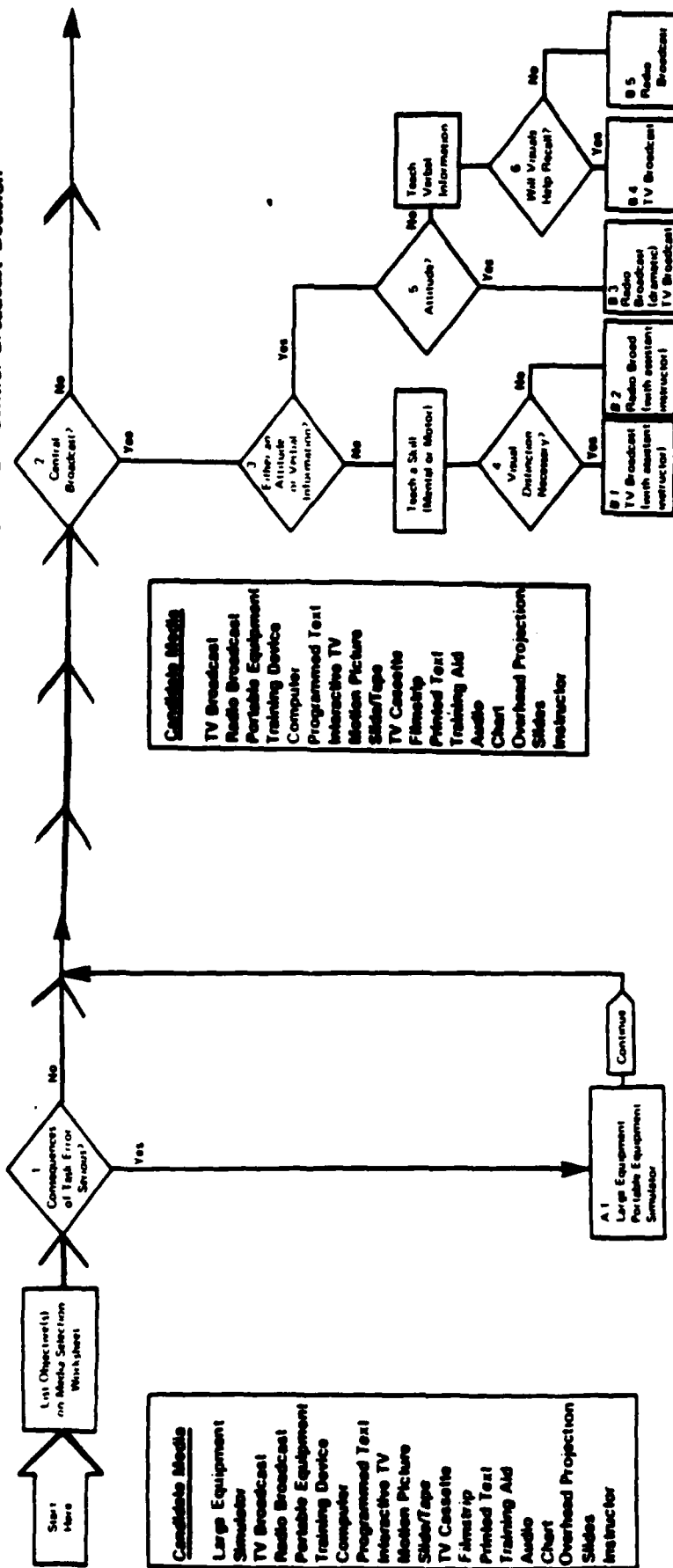
f) CAI Appropriate

- NA = Not analyzed
DEV = Previously analyzed/developed
Yes = Appropriate for CAI
No = Inappropriate for CAI
Deleted = Deleted from PUI

g) Estimated Relative Time/Cost

1. about the same as an average segment
2. more time/cost than an average segment
3. much more time/cost than an average segment

Chart A. Job Competence Decision



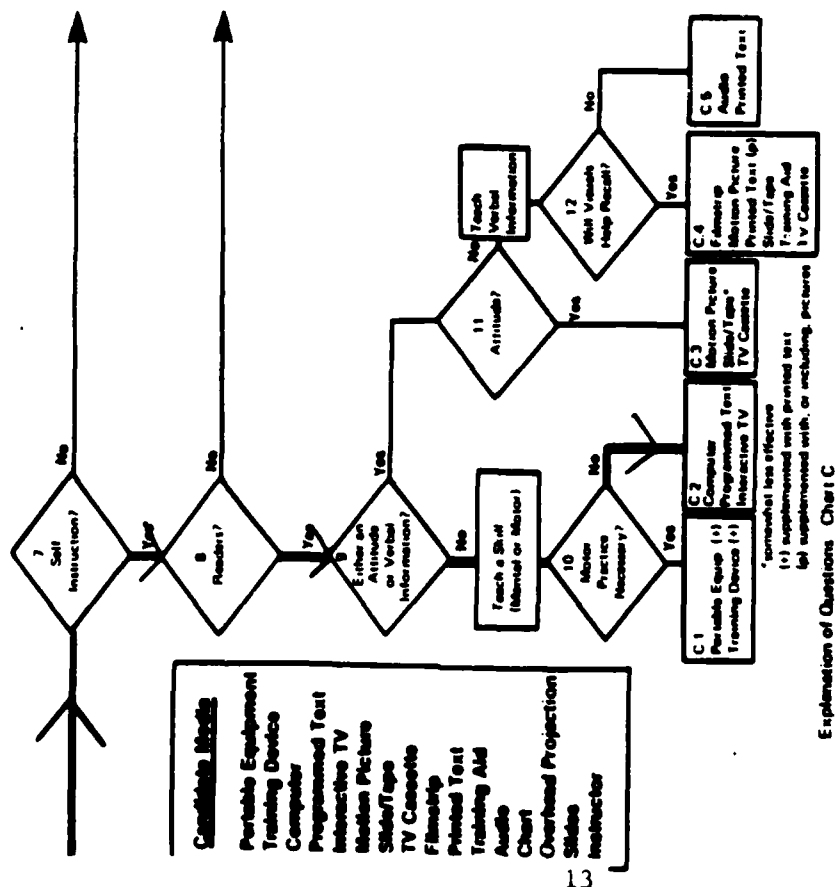
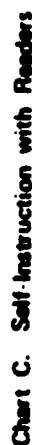
Explanation of Questions Chart A

1. Consequences of Task Error Serious? When the student is first required to perform the task outside of the instructional setting, are the consequences of error serious?

Explanation of Questions Chart B

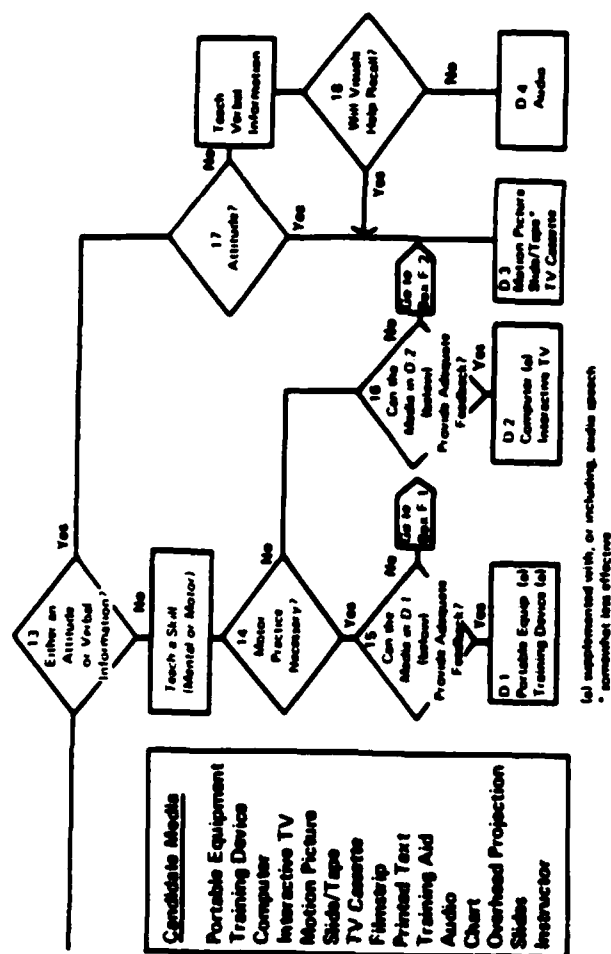
2. Central Broadcast? Is the instructional system designed to serve students who are dispersed over a wide geographic area and who are able to receive centrally broadcast instruction at scheduled times?
3. Either an Attitude or Verbal Information? Is the aim either to influence the student's values (attitudes) or to have the student learn to 'state' (rather than 'do') something?
4. Visual Distinction Necessary? Is the visual presentation of task features necessary or will it aid in learning the task?
5. Attitude? Does instruction aim to influence the student's values or opinions?
6. Will Visuals Help Recall? Is it likely that the use of visuals will help the student establish images that will aid recall of verbal information?

Figure 1. Example of Media Selection Analysis Using Model "Prepare for an NBC Attack"



Explanation of Questions Chapter C

7. *Self Instruction?* Are students expected to learn by self instruction, without an instructor?
8. *Readers?* Can the students, with reasonable efficiency, gain information from printed text?
9. *Either an Attitude or Verbal Information?* Is the aim either to influence the student's values (attitudes) or to have the student learn to "state" (rather than "do") something?
10. *Motor Practice Necessary?* Does the skill to be learned require smooth timing of muscular movements (a "motor skill")?
11. *Attitudes?* Does instruction aim to influence the student's values or opinions?
12. *Will Visuals Help Recall?* Is it likely that the use of visuals will help the student establish images that will aid recall of verbal information?



Explanation of Questions · Chart D

13. Either an Attitude or Verbal Information? Is the aim either to influence the student's values (attitudes) or to have the student learn to 'use' (rather than 'do') something?
14. Motor Practice Necessary? Does the skill to be learned require smooth timing of muscular movements (a "motor skill")?
15. Can the Media in D.1 Provide Adequate Feedback? Can the media in D.1 accept and evaluate the desired student responses and provide the type of feedback required?
16. Can the Media in D.2 Provide Adequate Feedback? Can the media in D.2 accept and evaluate the desired student responses and provide the type of feedback required?
17. Attitude? Does instruction aim to influence the student's values or opinions?
18. Will Visuals Help Recall? Is it likely that the use of visuals will help the student establish images that will aid recall of verbal information?

Figure 1. Example of Media Selection Analysis Using Model "Prepare for an NBC Attack"

Copy available to DTIC does not permit full-text reproduction

Chart E. Instructor with Readers

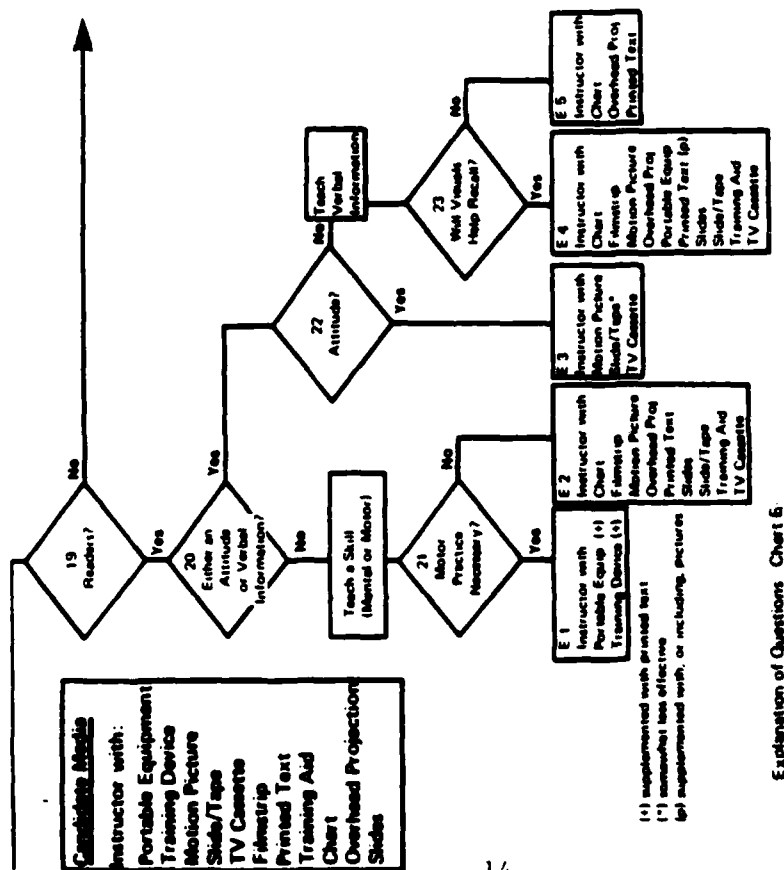
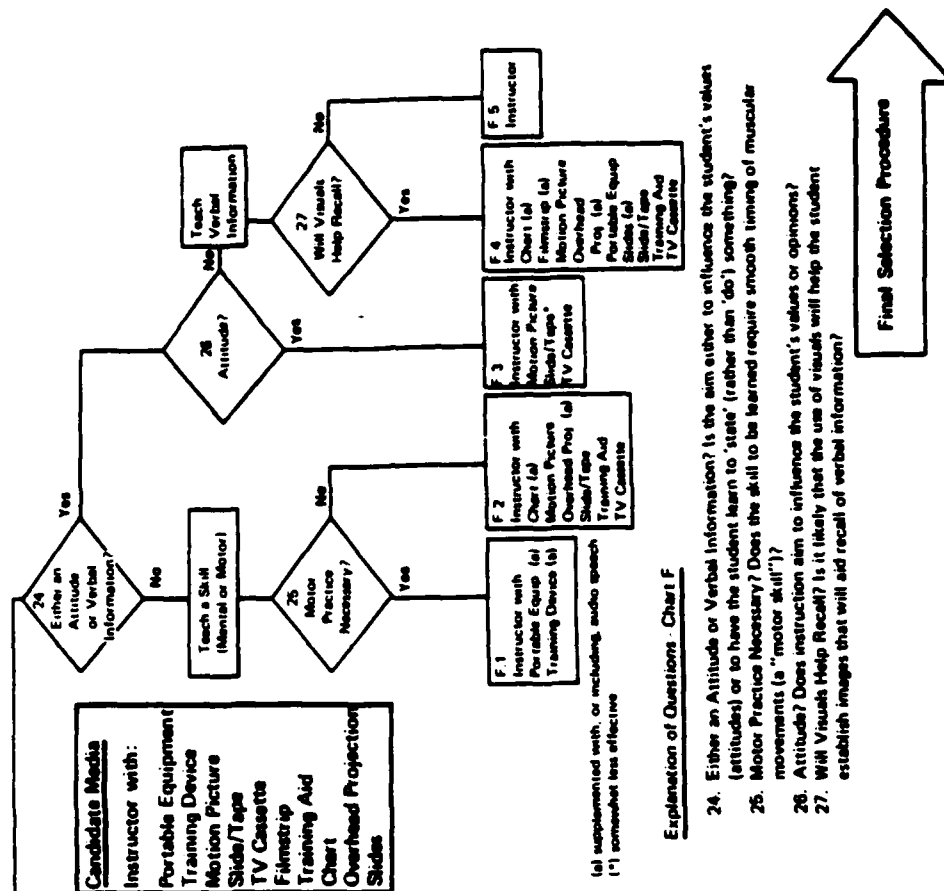


Figure 1. Example of Media Selection Analysis Using Model "prepare for NBC Attack"

Chart F. Instructor with Non-Readers



Next, possible instructional design strategies were sketched out. At the crawl level for this objective, the student could learn the format rules for the written report. The student could be tested by identifying information for each portion of the order. This objective was judged to be inappropriate for the walk and run levels on CBT since these levels require student generated verbal interactions of variable types. Finally, the possible design sketches were used to determine what CBT features would be required. For the most basic lesson on this objective the following features would be required:

- o cartoons
- o text displays
- o marking student response
- o automated right/wrong scoring
- o written feedback with branching and visual cues
- o learner control of sequence
- o selected response answer type

Additionally, audio, video stills and/or video motion could be used to depict scenarios. For this objective, the instructional requirements were estimated to require about an average amount of time and cost to develop CBT based on this preliminary design sketch.

Note: For the purpose of this analysis, design sketches presented here are preliminary and based only on an initial analysis of lesson plans. These design sketches are only intended to give an idea of what the costs might be for developing a particular objective at a particular level. Complete designs will be done during the Courseware Design task.

The analysis procedure was conducted for all identified objectives on the POI. The collected information was then used for the next two processes: application of the media selection model and final selection process.

Step 3: Applying the Final Selection Process

From the objectives found appropriate for CBT development, final recommendations were made based on the following factors:

1. A mix of objectives which could be completed in the time and budget allotted.

2. ARI priority.
3. Student GO rates.

Three factors were considered when determining the relative time/cost to convert objectives to computer-based instruction on a project of this type:

1. The performance level or depth of each objective to be taught.
2. The instructional design and resulting required instructional features for each objective.
3. Whether an instructional model must be custom-designed and coded or an existing model can be adapted for each objective.

Performance levels and preliminary instructional design sketches were compared with the relative cost of required instructional features and whether a new instructional model would be required. Groups of objectives were then selected which were estimated could be completed within the time and cost of this project. The time/cost factor listed in Table 2 refers to an estimate of the relative time/cost to complete a segment at the performance level found appropriate for CBT conversion. For example, "Prepare for an NBC Attack" was found appropriate for CBT at both the crawl and walk levels. The time/cost factor for this objective was judged to be 1 at the crawl level. If a walk level were developed, the time/cost would be more. Generally, the time/cost weighting factors refer to the highest level found appropriate for CBT, unless otherwise noted.

ARI previously articulated priorities for conversion of 19K BNCOC objectives into computer-based training. These priorities were used to recommend the objectives to be taught. Radio Net had already been selected by ARI to be included in this project. Priorities for the remaining objectives were:

1. NBC Defense.
2. Mine Warfare.
3. Tactics.
4. Call for/Adjust Indirect Fire.
5. Maintenance Supervision.
6. Any other objectives found appropriate for CBT.

ARI priorities for objectives are noted on Table 2 under the column marked "ARI priority". These priorities were used in compiling objectives for all options.

Student passing or GO rates for some 19K BNCOC objectives and prerequisites were available for the analysis. The percentage of students receiving GOs is noted on Table 2 under the column "Student GO levels." When selecting objectives to be taught using GO levels, those with the lowest number of students passing were selected first, then the next lowest and so on. Table 2 summarizes the data gathered during the media selection analysis process.

RESULTS

Performance Levels are noted in the column labeled "Objective Level". Objectives listed on the POI and in lesson plans were found to vary widely in performance level. Some objectives, such as "Direct Consolidation and Reorganization on the Objective", were tested at the crawl level, although clearly the run level would be required in the field to assure competency. Others, such as "Initiate Unmasking Procedures", were tested at the the run level.

The results of the Media Selection Model are noted in the column labeled "CBT approp.". All objectives submitted to the modified media selection model were found to be appropriate for conversion to CBT either at the crawl or walk level. While some objectives could not be done on the run or walk level as stated on the POI, all could be done on the crawl level. For example, "Implement MOPP" is stated at the run level on the POI, but could easily be done at the crawl level on CBT by having the student identify correct MOPP levels.

The final selection process results are explained in the next section.

OPTIONS FOR CBT DEVELOPMENT: RECOMMENDATIONS

Three options for "packages" that may be developed for this project are offered based on the results of this analysis. The details of each option are summarized in Table 3, Table 4, and Table 5. Each option provides a complete list of objectives to be developed on this project. Although it is suggested that ARI select one of the options based on the information given, modifications to one of the options would also be possible (for example, Option Two might be chosen but a particular objective with high priority might be switched with one of high student NO GO level).

Option One provides the greatest overall coverage of high priority objectives. Every effort was made to include all objectives in ARI's high priority areas (NBC, Mine Warfare, Tactics, Call for/Adjust Indirect Fire, Maintenance Supervision). Since objectives in all ARI priority areas were covered, student GO rates were not considered in compiling the list.

Because most of the objectives in this option are at the crawl level, this option would result in many lessons of an intellectual type where the student is presented rules or information about the task and required to answer questions. A few of the objectives (e.g. Radiacmeter and Chemical Kit) might be treated as part-task simulations. Objectives were also selected to fully utilize already existing instructional and coding models, so as to maximize the amount of time available to develop additional lessons.

Note: The lesson plan for Call for/Adjust Indirect Fire calls for four classroom hours to complete all objectives. Preliminary examination of the materials and consultation with in-house Subject-Matter Experts indicate that at least 10-20 classroom hours would be required to adequately cover this material, depending on students' skill in math and map reading. Therefore, all options treat this task, and its enabling objectives, as needing more extensive treatment than indicated in the lesson plan.

Option Two provides an in-depth coverage of objectives which have low student GO rates. Those objectives with the lowest GO rates on first try would be treated in depth under this option. While this option would provide coverage in fewer BNCOC areas, it would fill some of the gaps that currently exist in classroom instruction by completely covering some objectives through the walk level.

In addition to Radio Net and Call for/Adjust Indirect Fire, this option includes instruction in high priority areas of NBC, Mine Warfare and Tactics, but over a narrower range of objectives. It also includes an in-depth treatment of Call for/Adjust Indirect Fire.

Option Three is a compromise between Options One and Two. This option provides a moderate depth of instruction over a moderate number of objectives. This option provides for a more in-depth treatment of objectives within Call for/Adjust Indirect Fire, NBC Defense, Mine Warfare and Tactics than Option One but over more total objectives than Option Two.

Table 3

Option One

Task	Level	POI hours	Time/cost
Radio net	walk	4	3
Call for/Adjust Indirect Fire	crawl	4 (10-20)**	1
Prepare for NBC Attack	crawl	1	1
Unmasking	walk	1	2
Chemical Kit	walk	*	2
MOPP	crawl	*	1
Radiacmeter	walk	1.7	2
Read and Report Radiation	crawl	1	1
NBC 1	crawl	1	2
NBC 4	crawl	1	2
Install/Remove Hasty Minefield	crawl	4	1
Oral Order	crawl	4	1
Direct Consol.	crawl	2	1
Supervise Maint.	crawl	7	1
Inspect DA form for Errors	crawl	2.2	1

Note: Level indicates the performance level that would be taught on CBT. Hours in POI indicate the number of classroom hours allocated to this objective. The time/cost factor is a relative comparison of the time and cost it would take to convert a given objective into CBT compared to a "typical" CBT lesson. One indicates an average time/cost factor, Two indicates an above average time/cost factor, and Three indicates a much greater than average time/cost factor.

- * Indicates that the time is included in the time for another objective.
- ** The numbers in parentheses indicate the number of hours estimated to adequately teach this topic in the classroom. The lesson plan currently allows only four hours.

Table 4

Option Two

Task	Level	POI Hours	Time/Cost	GO rate
Radio Net (given)	walk	4	3	86%
Call for/Adjust Indirect Fire	walk	4 (10-20)**	3	6.25%
NBC 1	walk	1	2	65%
Super. Maint.	walk	7	3	74%
Install/ Remove Hasty Minefield	walk	4	2	78% 85%
NBC 4	walk	1	2	86%

Note: Level indicates the performance level that would be taught on CBT. Hours in POI indicate the number of classroom hours allocated to this objective. The time cost factor is a relative comparison of the time and cost it would take to convert a given objective into CBT compared to a "typical" CBT lesson. One indicates an average time/cost factor, Two indicates an above average time/cost factor, and Three indicates a much greater than average time/cost factor.

- * Indicates that the time is included in the time for another objective.
- ** The numbers in parentheses indicate the number of hours estimated to adequately teach this topic in the classroom. The lesson plan currently allows only four hours.

Table 5

Option Three

Task	Level	POI Hours	Time/Cost
Radio Net	walk	4	3
Call for/Adjust Indirect Fire	walk	4 (10-20)**	2/3
NBC 1	walk	1	2
Super. Maint.	crawl	7	2
Install/Remove Hasty Minefield	walk	4	2
NBC 4	walk	1	2
Prepare for NBC Attack	walk	1	1
MOPP	walk	1	2

Note: Level indicates the performance level that would be taught on CBT.

Hours in POI indicate the number of classroom hours allocated to this objective. The time cost factor is a relative comparison of the time and cost it would take to convert a given objective into CBT compared to a "typical" CBT lesson. One indicates an average time/cost factor, Two indicates an above average time/cost factor, and Three indicates a much greater than average time/cost factor.

* Indicates that the time is included in the time for another objective.

** The numbers in parentheses indicate the number of hours estimated to adequately teach this topic in the classroom. The lesson plan currently allows only four hours.

CONCLUSION

Objectives selected by ARI from the 19K BNCOC POI and Call for/Adjust Indirect Fire lesson plan were subjected to a three part media selection process. First, objectives were categorized by performance level (crawl, walk or run). Second, a media selection model was applied. Finally, the instructional requirements of each objective were compared to the performance level of each objective, so that relative time/costs to develop were obtained. Recommended objectives then were grouped into three possible options for conversion based on whether objectives could be completed in time and budget, Army Research Institute priority and current student passing (GO) levels.

All objectives analyzed were found appropriate for conversion to CBT on either the crawl or walk levels. Three options for objectives to develop were offered. The options varied in the number of objectives to be developed and the depth to which each objective would be taught. Option One provides the greatest number of objectives to be taught. Option Two provides an in-depth treatment of objectives for which students have low GO rates. Option Three provides a compromise between depth within objectives and the number of objectives taught.

REFERENCES

- Briggs, Leslie, editor (1977). Instructional Design--Principles and Applications. Englewood Cliffs, NJ: Educational Technology Publications.
- Gagne, Robert M. and Briggs, Leslie J. (1978). Principles of Instructional Design. New York: Holt, Rinehard and Winston.
- Gerlach, Vernon S. and Ely, Donald P. (1980) Teaching and Media: A Systems Approach. Englewood Cliffs, NJ: Prentice Hall, Inc.
- Marco, R. A., Begg, J., Israelite, L., Bernstein, K. (1985). Instructional technology report. Technical report in preparation for the U.S. Army Research Institute, Fort Knox, KY.
- Reiser, Robert A. and Gagne, Robert M. (1983). Selecting Media for Instruction. Englewood Cliffs, NJ: Educational Technology Publications.
- Romiszowski, A. J. (1981). Designing Instructional Systems. New York, NY: Nichols Publishing.

APPENDIX A
SAMPLE OBJECTIVE ANALYSIS FORM

TASK NO. 071-326-5626

TITLE: Tactics: Prepare & Issue and Oral Operation Order

OBJECTIVE: Given a platoon leaders oral order, TC prepares an oral order
using standard 5 paragraph field order.

LEARNING DOMAIN

☐ COGNITIVE
☒ INTELLECTUAL

☐ DISCRIMINATION
☐ CONCRETE CONCEPT
☐ DEFINED CONCEPT
☒ RULE
☐ PROBLEM SOLVING

☐ INFORMATION
☐ PSYCHOMOTOR
☐ ATTITUDE

INSTRUCTIONAL SETTING

☒ INDIVIDUAL
☐ GROUP
☐ FIELD

SOURCE MATERIALS: CHECK ITEMS ON HAND

FM 7-7 ☐
FM 71-2 ☐
OPORDS ☐
 ☐
 ☐

CAN WE USE CAI FOR ENTIRE OBJECTIVE? ☐ YES ☒ NO

☐ CRAWL ☒ WALK ☐ RUN

COMMENTS:

CAI can be used to teach the format rules and to illustrate
what kinds of information is placed in each section of the operation order.
Perform testing of an actual oral order is impractical for CAI. Goal might
be to teach soldiers the 5 paragraph headings and the kinds of information
contained in each segment. We will need assistance generating accurate
scenarios.

TITLE Prepare & Issue Oral Operational Order

TASK NO. 071-326-5626

INSTRUCTIONAL REQUIREMENTS
What CBT Can Provide

✓ = crawl
X = walk

CATEGORY USE? INCREASED COST?

Display/Presentation Requirements

Audio	[X]	yes
Unenhanced video (still)	[X]	yes
Enhanced video (still)	[]	yes
Realistic Graphics	[]	yes
Enhanced Graphics	[]	no
Line Drawings	[]	no
Cartoons	[✓]	yes
Video Motion	[X]	yes
Written words/numbers	[✓]	no

Student Response Requirements

Written/Typed	[]	no
Oral	[]	yes
Point, Touch, Mark	[✓]	sometimes
Manipulate 2D hardware	[]	yes

Response Detection/Evaluation

Student self-observation	[]	yes
Automated Right/Wrong scoring	[✓]	no

Feedback/Guidance Requirements (Costs rise with increased completeness of feedback.)

Written	[✓]	no
Oral	[]	yes
Branch to new display	[✓]	no
Real-time interaction	[]	yes
Performance playback	[]	sometimes
Visual cuing	[✓]	no
Help	[]	yes

Learner Control Requirements

Learner controls content and sequence	[]	yes
Learner controls content only	[]	yes
Learner controls sequence only	[]	no
No learner control	[✓]	no

Answer Type

Selected Response	[✓]	no
Student generated short answer	[]	sometimes
Simulation	[]	yes

APPENDIX B
SELECTION OF OBJECTIVES FOR THE ANALYSIS

The following objectives were eliminated from the analysis because they have been deleted from the 19K BNCOC instruction according to a 19K BNCOC instructor:

- o Law of the Land Warfare/SAEDA Orientation.
- o Equal Opportunity.
- o Alcohol and Drug Abuse Prevention.
- o Determine Directions Using Field Expedient Methods.
- o Use an AN/PDR-27 Radiac Set.
- o Prepare and Submit Standard Shelling, Mortaring and Bombing Report.
- o Code of Conduct.
- o Moral and Ethics Development.

Objectives in the following areas have been eliminated from the analysis because they have already been analyzed and/or developed into CBT. All of the objectives under the following areas have been eliminated for this reason.

- o Land Navigation.
- o Military Communications.
- o Course Review and Diagnostic Testing.

Some objectives in the following areas have been eliminated from the analysis because ARI judged them inappropriate for CBT due to a requirement for field setting or hands-on training. See Table 2 for the specific objectives under each category that have been eliminated for this reason. These objectives fell into the following categories:

- o Select Firing Position.
- o Tactical Field Training Exercise.
- o Situational Training Exercises.
- o NCO Responsibilities/Training.
- o Maintenance.